

kins, Medical Division, Army Chemical Center, Maryland, who has contributed so materially to our knowledge of medically important insects.

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ENTOMOLOGY.—*Recent advances in the taxonomy and distribution of Grylloblatta (Orthoptera: Grylloblattidae)*. ASHLEY B. GURNEY,<sup>1</sup> U. S. Bureau of Entomology and Plant Quarantine.

This paper summarizes the important developments regarding the genus *Grylloblatta* which have come to my attention during the past five years. In 1948 I brought together the principal taxonomic and distributional data on these unusual insects (Gurney, 1948) and it is a tribute to the zeal of numerous diligent collectors that several extensions of the generic distribution have recently been made, and at least two new species have been found. Best of all, both sexes of the two new species here described are known, and the great importance of the male terminalia as specific characters is now evident. The contents of the alimentary canal have been removed from specimens of three species (*rothi*, *bifratrilecta*, *sculleni*), and notes on the results of the examination appear in the discussion of those species. Annotations are included on several important papers which have appeared since my 1948 catalogue was

written. Special interest is attached to a related new genus from Siberia described by Bei-Bienko (1951), whose paper has been translated by Miss Ruth Ericson, of the Bureau of Entomology and Plant Quarantine.

## KEY TO SPECIES OF GRYLLOBLATTA

1. Dorsal valve of ovipositor reaching to middle of cercus, or at least to apical half of fifth segment; antenna of adult composed of 36 segments or less, of nymph not over 30... 2
  - Dorsal valve of ovipositor not reaching to middle of cercus, or beyond base of fifth segment; antenna of adult often composed of 39 or more segments, of nearly mature nymph usually more than 30 (northern California, Oregon)..... 5
2. Apical half of male supra-anal plate symmetrical or nearly so (Fig. 3) (Washington to Montana and northward)..... 3
  - Apical half of male supra-anal plate asymmetrical (Figs. 4, 5) (Oregon, California)... 4
3. Stylus of male about three times as long as wide (Fig. 8); antenna of adult with an average of less than 30 segments (Alberta, British Columbia, Montana)
  - campodeiformis campodeiformis* Walker
  - Stylus of male about four times as long as wide (Fig. 8a); antenna of adult with an average of more than 30 segments (Washington, British Columbia)
    - campodeiformis occidentalis* Silvestri
4. Stylus of male attached laterally (Fig. 6); male supra-anal plate with left apical corner conspicuously developed, lobelike (Fig. 5); segments of cerci comparatively short (Figs. 14, 16) (Oregon)..... *rothi*, n. sp.
  - Stylus of male attached basally (Fig. 7); male supra-anal plate with left apical corner angular rather than lobelike (Fig. 4); segments of cerci comparatively elongate and slender, especially the more apical ones (Fig. 15) (California)..... *bifratrilecta*, n. sp.
5. (Adult unknown), antenna of nymph composed of 36-40 segments; compound eye prominent, proportion of greatest length of eye to width

<sup>1</sup> The cooperation of the following persons, who have assisted by making specimens and notes available, is gratefully acknowledged: Henry K. Townes, North Carolina State College; Vincent D. Roth, Oregon State College; J. W. MacSwain, E. G. Linsley, and Paul D. Hurd, Jr., University of California (Berkeley); E. Philip Pister, U. S. Fish and Wildlife Service, Berkeley, Calif.; Harry P. Chandler, California Division of Fish and Game; John A. Chapman, Montana State University; and W. L. Nutting, Harvard University. Thanks are also given to the following University of California students who made a special and highly successful attempt to find *Grylloblatta* at Sonora Pass, Calif., while engaged in summer field activities with Dr. MacSwain: O. R. Ali, C. A. Downing, J. J. Drea, S. M. Kappos, S. Katana, J. L. Mallars, and B. Puttler. For several days these men worked very hard at a task which was difficult and sometimes dangerous, and as a result the specimens of *bifratrilecta* are more numerous and complete than the original series of any previously described species of Grylloblattidae.

of head about as 1:4.4; color of body grayish brown (northern California)

*barberi* Caudell  
Antenna of nymph normally containing 31-32 segments; compound eye distinctly smaller than above, proportion of greatest length of eye to width of head about as 1:5.8; color of body light amber, paler than in *barberi* (Oregon).....*sculleni* Gurney

***Grylloblatta rothi*, n.sp.**

Figs. 1, 5, 6, 10-12, 14, 16

Male (holotype): Size small for genus; body clothed with fine pubescence; major body setae less conspicuous than usual for genus. Antennae with 29 segments (left), 19 (right, broken); compound eye large (Fig. 1), longer with respect to head size than in *C. campodeiformis*; pronotum with lateral margins noticeably converging posteriorly, more so than in holotype of *sculleni*; legs comparatively short and stout; leg ratios (length divided by width) as follows: front femur, 2.8; hind femur, 4.8; front tibia, 5; hind tibia, 9.

Supra-anal plate borne asymmetrically, so that base of left cercus is posterior to right cercus (Fig. 5); plate with highly distinctive lobelike development of left posterior apical corner; left coxite more elongate than in *c. campodeiformis*, oblique mesal margin decidedly rounded rather than nearly straight as in latter, pubescent but lacking distinctive major setae; right coxite with usual pubescence, but lacking strong lateral setae such as those of *bifratrilecta*; left and right styli each borne laterally on basal half (Fig. 6); phallic sclerites of same pattern as in *campodeiformis*, but differing in details; main phallic sclerite with dorsolateral lobe (Fig. 10, *dll*) about half as long as lateral margin below the dorsal cap, unlike much shorter lobe in *campodeiformis*; ventrolateral lobe (*vll*) not as produced as in *c. campodeiformis*; apical lobe of accessory sclerite

of right phallomere (Fig. 12) rounded and lobelike, less elongate and tapering than in *c. campodeiformis* (Fig. 13). Cerci without dark major setae such as occur in other species, though pale delicate counterparts appear to occur amid pubescence; segments relatively short, basal segments as in female (Fig. 16), terminal segments (Fig. 14) much shorter than usual for genus.

Coloration: General coloration very pale, much of body antimony yellow (Ridgway), grading to dark yellow ocher (Ridgway) on dorsal surface of abdomen and the posterior half ventrally; antennae, legs, coxites, and cerci lighter (warm buff, Ridgway); eyes black.

Measurements (lengths in millimeters): Body, 14.5; antenna, 8; eye, 0.53; pronotum, 2.35; hind femur, 3.3; hind tibia, 3.2; cercus, 3.4; width of head, 2.4; of pronotum, 2.18; of hind femur, 0.7.

Female (allotype) (specimen relaxed and transferred to alcohol after being dry on a pin): Differing from male in somewhat larger size, proportionately more slender hind tibia, much darker color (possibly due to method of preservation), and the usual sexual features. Antennae with 23 segments (left, broken), 29 (right); leg ratios (length divided by width) as follows: front femur 3, hind femur 4.9, front tibia 5.7; hind tibia 11.

Abdominal appendages (Fig. 16) with three terminal segments of cerci missing, dorsal valve of ovipositor apparently reaching to segment seven, with weakly developed setae on basal half; several transverse fracture lines on middle and lower valves (apparently due to breakage).

Coloration: General body color brown, legs, abdomen and its appendages paler and about cinnamon; antennae prout's brown (Ridgway), with some irregular paler areas.

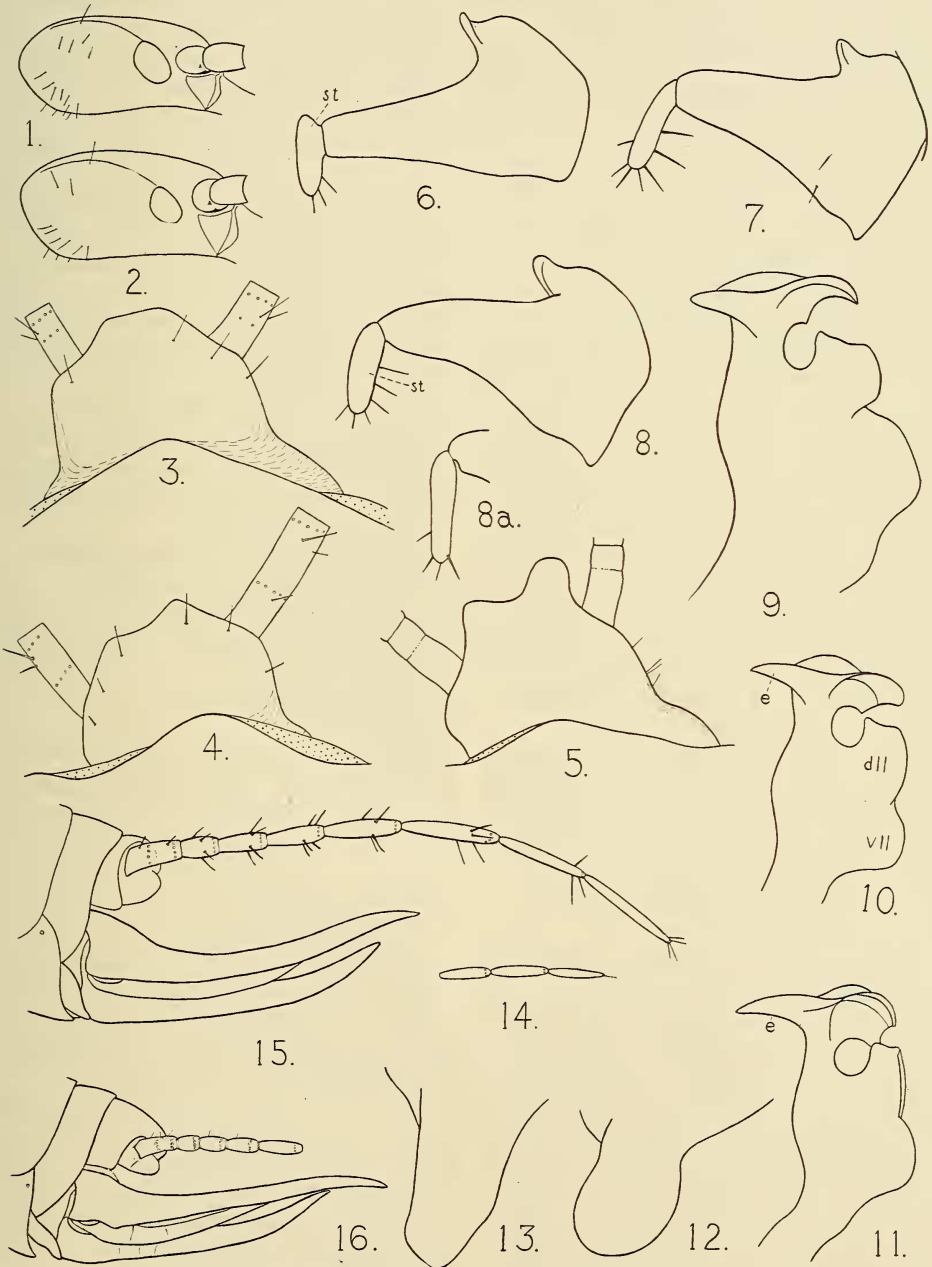
Measurements (lengths in millimeters): Body,

FIGS. 1-16.—1, *Grylloblatta rothi*, male holotype, lateral view of head; 2, *G. campodeiformis campodeiformis*, male from Gallatin County, Mont., lateral view of head; 3, Same specimen as Fig. 2, dorsal view of supra-anal plate; 4, *G. bifratrilecta*, male holotype, dorsal view of supra-anal plate; 5, *G. rothi*, male holotype, dorsal view of supra-anal plate; 6, *G. rothi*, holotype, lateral view of right coxite and stylus; 7, *G. bifratrilecta*, holotype, lateral view of right coxite and stylus; 8, *G. c. campodeiformis*, male specimen from Gallatin County, Mont., lateral view of right coxite and stylus; 8a, *G. c. occidentalis*, male topotype from Mount Baker, Wash., lateral view of apex of right coxite and stylus; 9, *G. c. campodeiformis*, male specimen from Gallatin County, Mont., oblique view of main phallic sclerite; 10, *G. rothi*, holotype, oblique view of main phallic sclerite; 11, *G. rothi*, holotype, lateral view of main phallic sclerite; 12, *G. rothi*, holotype, apical lobe of right phallomere; 13, *G. c. campodeiformis*, Gallatin County, Mont., apical lobe of right phallomere; 14, *G. rothi*, holotype, terminal three segments of cercus; 15, *G. bifratrilecta*, female allotype, terminal structures of abdomen; 16, *G. rothi*, female allotype, terminal structures of abdomen, (three terminal segments of cerci missing) same scale as Fig. 14. (*dll*—dorsolateral lobe of main phallic sclerite; *e*—apex of copulatory process; *st*—stylus; *vll*—ventrolateral lobe of main phallic sclerite.)

16; antenna, 9; eye, 0.5; pronotum, 2.5; hind femur, 3.4; hind tibia, 3.4; width of head, 2.4; of pronotum, 2.2; of hind femur, 0.7; of hind tibia, 0.31.

*Type*.—U.S.N.M. no. 61656. A male from Happy Valley, on Century Drive about 15 to 20 miles south of Sisters, Oreg. Altitude, 6,450

feet, about 2,000 feet below lowest snowfields. Collected September 12, 1948, by Vincent D. Roth. Found in the center of a rotten log about 2½ to 3 feet in diameter while Mr. Roth was collecting spiders. "The wood was almost completely decayed and it was fairly damp in the center. The area around was typical for the



Figs. 1-16.—(See opposite page for legend).



country, small pine with not too much undergrowth. There was a stream about 100 feet away and a meadow about the same distance" (V.D.R.). Mr. Roth also wrote that the specimen was exposed to the sun but moved slowly. Then it was placed in a vial with some damp organic matter, and when removed from his pocket a few minutes later it had died. Fragments of unidentifiable insect material were in the digestive tract.

*Allotype*.—A specimen in the U. S. National Museum, one of two females reported by Elsea (1937). They were found beneath a stone at 6,500 feet altitude at Crater Lake, Oreg., on November 27, 1936. The location of Elsea's second specimen is unknown. Crater Lake is approximately 90 miles south of Happy Valley, and both localities are situated along the eastern margin of the Cascade Mountains.

The shortness of the cercal segments separates *rothi* from all other species except possibly *barberi*, and the character is so distinctive that the association of sexes is believed correct. Judged by nearly mature nymphs, which appear to give a satisfactory indication, *barberi* has a much larger number of antennal segments than *rothi*. The latter is the first of the genus to be found with a highly asymmetrical male supra-anal plate. The type locality of *rothi*, Happy Valley, is only some 20 miles southeast of McKenzie Pass where *sculleni* occurs, but the nature of the cerci leaves no doubt regarding the distinctness of the two species, though the male of *sculleni* is still unknown.

It is a pleasure to name this new species for Vincent D. Roth, who for several years has shown a remarkable and persistent interest in collecting *Grylloblatta*.

*Grylloblatta bifratrilecta*,<sup>2</sup> n. sp.

Figs. 4, 7, 15

Male (holotype): Size medium for genus; fine body pubescence and major setae moderately conspicuous, more so than in *rothi*; antennae with 28 segments (left), 30 (right); compound eye proportionately smaller than in *rothi*, about as in *c. campodeiformis*; pronotum with lateral margins moderately converging posteriorly; legs much as in *c. campodeiformis*, ratios (length divided by width) as follows: front femur, 3.1; hind femur, 5.7; front tibia, 6.2; hind tibia, 10.8.

Supra-anal plate borne asymmetrically; plate

<sup>2</sup> Meaning "collected by two brothers," with reference to Henry K. and George Townes.

with apical half moderately asymmetrical, with apical corners angular, the left corner more produced than the right (Fig. 4); left coxite with mesal margin broadly rounded, unlike *c. campodeiformis*, but less produced than in *rothi*, a major seta on disc of coxite slightly laterad of and a little posterior of the middle, another major seta near mesal margin at about middle; right coxite (Fig. 7) with two major setae; styli each borne basally, more elongate than in *c. campodeiformis*; main phallic sclerite with apical lip of copulatory process (*e*) stouter in lateral view than in *rothi*, dorsolateral and ventrolateral lobes much as in *rothi*; apical lobe of accessory sclerite of right phallomere differing from *rothi* in having the lateral margins nearly parallel.

Measurements (lengths in millimeters): Body, 20; antenna, 12.5; eye, 0.5; pronotum, 2.8; hind femur, 4; hind tibia, 4.3; cercus, 5.9; width of head, 2.7; of pronotum, 2.45; of hind femur, 0.7; of hind tibia, 0.4.

Coloration: Body mainly ochraceous buff (Ridgway); the terga slightly darker than sterna; coxites, cerci, and tarsi paler; head and antennae darkened to zinc orange (Ridgway), latter paler in apical third; eyes black.

Female (allotype): Differing from male in somewhat more robust body and slightly more elongate legs, in addition to usual sexual characters. Antennae with 31 segments (left), 30 (right); leg ratios (length divided by width) as follows: front femur, 3.1; hind femur, 6.6; front tibia, 6.4; hind tibia, 12.3.

Abdominal appendages (Fig. 15) with short, stout setae well represented on basal half of dorsal valves and basal half and ventral margin of ventral valve; dorsal valve reaching to segment 6 of cercus; major setae of cercus conspicuously developed.

Coloration: As in male.

Measurements (lengths in millimeters): Body (rather contracted), 17; antenna, 12.5; eye, 0.5; pronotum, 3.1; hind femur, 4.6; hind tibia, 4.9; cercus, 6; width of head, 3.1; of pronotum, 2.7; of hind femur, 0.7; of hind tibia, 0.4.

*Type*.—U.S.N.M. no. 61132. Male from Sonora Pass, Calif., elevation 9,000 to 10,000 feet, collected July 20, 1951, by J. W. MacSwain. (Sonora Pass is on California Highway 108 about 50 miles southeast of Lake Tahoe and about 10 to 15 miles north of the northern boundary of Yosemite National Park.)

*Allotype*.—U.S.N.M. Female from two miles



west of Sonora Pass, Calif., elevation about 8,600 feet, collected by Henry K. Townes and George Townes, July 7, 1948.

There are 13 paratypic adults, 12 females and 1 male. Five rather large and 25 small nymphs are not considered paratypes. All are from Sonora Pass, though differing in exact spot, elevation, date, and collector. In addition to the allotype, the Townes brothers collected one adult female and 12 nymphs on July 4, 1948, and 7 females and 9 nymphs on July 7, 1948. Dr. MacSwain collected one nearly mature female on August 4, 1948, and the remainder of the series was taken by him or his associates in 1951, as follows: June 27, three nymphs; July 11, one male, two females, four nymphs; July 13, one nymph; July 20, two females. In addition to the U. S. National Museum, paratypes will be deposited at the following institutions: Academy of Natural Sciences of Philadelphia; Museum of Zoology, University of Michigan; University of California; California Academy of Sciences.

The body length of the male paratype is 19 mm, pronotal length 2.7 mm. Female paratypes vary in body length from 17 to 20 mm, in pronotal length from 2.7 to 3 mm. The antennae of the paratypes which clearly are unbroken (16 antennae) range in the number of segments from 27 to 32, with an average of 30.2. Two paratypes have the ovipositor reaching only to the apical half of the fifth segment of the cercus. Two females and a male taken July 11, 1951, are noticeably redder than the others, being reddish cinnamon-rufous (probably due to some difference in preservation). Other adults are comparable to the type and allotype in color. The nymphs are paler, the smallest one whitish except for the black eyes.

Females of *bifratrilecta* may easily be confused with those of *campodeiformis campodeiformis*, though the leg proportions are slightly different. The front tibia of *c. campodeiformis* is proportionally stouter, with the several pairs of spine-like setae along the ventral margins closer to each other than in *bifratrilecta*. The terminal segments of the cercus of *bifratrilecta* are less elongate than those of *sculleni*.

The Townes specimens were found on the north-facing slope of the canyon which walls Chipmunk Flat near the main highway that crosses the Sierras at Sonora Pass. The slope includes many cliffs and talus rock slides. The grylloblattids occurred by an isolated patch of

snow, about 50 by 20 feet located in a depression. The majority of specimens were taken near one side of the snow patch, where both large rocks and gravel occurred. Small nymphs were fairly common in the wet gravel, but large nymphs and adults were mainly under the larger rocks. The zone from about a foot away from the snow to about 4 inches in from the margin beneath it was preferred habitat. The Towneses also observed a good deal of decaying organic material—including a few patches of dead grass and blown pine needles, and they found that Collembola, centipedes and millipedes were common.

Dr. MacSwain's 1948 nymph was found just below the 9,000-foot level under the retreating margin of a snow field on a north-facing slope. Specimens taken in June 1951 were at about 10,500 feet and either were at the margin of snow or under large rocks protruding through or near the snow. Other 1951 collections were made in several situations. Several specimens were under large rocks on either side of a stream running beneath a snow field. By digging away the loose rock and soil, Dr. MacSwain observed but was unable to capture two nymphs under a large boulder. This boulder was easily 15 feet from a large snowfield.

A night collecting trip was made July 20. Four students (Katana, Kappos, Puttler, and Downing) accompanied Dr. MacSwain to the 9,000 foot level by car, from where they climbed before dark to the base of some high cliffs. Just before darkness, which fell at 8:30 p.m. (daylight saving time), one female and two nymphs were found in a rocky crevice in the cliffs. They occurred under rocks on the moist side of the crevice a distance of several feet from snow and running water. Insect fragments found near the female suggested that she may have been feeding. After dark various patches of snow were examined and three adults were taken separately, one under the margin of a snow field, and two moving over the surface above. The holotype was taken at 10 p.m. running over the snow about 18 inches from the margin of a large snowfield. All the other specimens were either more closely associated with the retreating margins of snow patches or with places from which snow had disappeared. The temperature was warm enough so that sweaters were not needed and the moon was full but the sky overcast.

An adult female collected July 20, 1951, had many fragments of insects in the digestive tract,

especially broken sclerites and parts of legs. Pieces of an ovipositor and of a wing from a small hymenopteron, possibly a braconid, were recognized. Three other adults yielded fragments of a spider, of beetles, and the scales of a moth. In two small nymphs, 8 and 9 mm long, respectively, were found fragments of a tiny beetle, possibly one of the Pselaphidae, and of a spider. Dr. MacSwain informed me that specimens kept alive in a refrigerator at a constant temperature of 8°C. were fed freshly collected moths which were first immobilized by pinching. These specimens have been noted briefly by MacSwain (Pan-Pac. Ent. 29: 62. 1953).

An attempt to induce matings in captivity was abandoned by Dr. MacSwain because the male and female concerned tried to chew each other and had to be separated to prevent injury.

#### *Grylloblatta* spp.

What may prove to be an undescribed form of *Grylloblatta* occurs in Mono County, Calif., near the Mammoth Crest. Available material consists of a single adult female collected July 8, 1950, by Norman Reimers, a University of California student then engaged in making a biological survey for the U. S. Fish and Wildlife Service. The specimen was found at an altitude of about 12,000 feet, at the base of a snowfield adjacent to a small pool in which water temperature was about 36°F. The pool is near Lake Dorothy in the Upper Convict Basin. On the Mount Morrison Quadrangle of the U. S. Geological Survey topographic maps of the area, the pool is adjacent to a tiny lake southwest of Lake Dorothy on a direct line between Lake Dorothy and Lake Virginia, and about three-fourths of the distance from Lake Dorothy to the county line between Mono and Fresno Counties.

The specimen is much like *bifratrilecta* in general appearance, but the femora are more slender than in Sonora Pass females. There are 34 (right) and 33 (left) antennal segments, respectively, which is slightly more than have been found in *bifratrilecta*. Until more material is available, preferably including a male, it is desirable to postpone any definite judgment regarding the status of this population.

The Mammoth Crest is located in the area of the Mammoth Lakes and Devil's Postpile National Monument, and it forms an offshoot from what is considered the main crest of the Sierra Nevada Range. It is about 70 miles southeast of

Sonora Pass, suggesting that the distance and more especially the location rather apart from the main Sierra Nevada Range may have contributed to the development of a form at least subspecifically distinct from *bifratrilecta*.

Thanks to Harry P. Chandler, of Red Bluff, Calif., I have learned that he and his associates have collected *Grylloblatta* at several localities in the area surrounding Mount Lassen, and it is to be expected that they will publish on their discovery. It would naturally be suspected that the population might represent *G. barberi* Caudell, the type locality of which is some 25 miles or more south of Mount Lassen.<sup>3</sup> Unfortunately, the type series of *barberi* consists of nymphs only, though several specimens are nearly mature. Through Mr. Chandler's kind cooperation, I have examined some of the new material, including both male and female, but I am uncertain whether the specimens represent *barberi*. The discovery of a mature male at the type locality of *barberi* is highly important to a thorough comparison and resulting sound decision regarding the identity of populations in northern California.

#### *Grylloblatta sculleni* Gurney

*Grylloblatta sculleni* Gurney, Pan-Pac. Ent. 13: 164, figs. 7-11. 1937. Type locality by original designation: Scott Camp (6,600 feet altitude), Three Sisters, Cascade Mountains, Oreg.

One adult female and 48 nymphs, collected at the type locality October 11-12, 1952, by Vincent D. Roth, have been examined. The adult is much paler than the holotype. The ovipositor extends to the base of the fifth segment of the cercus, slightly longer than in the holotype, and both specimens have 39 segments in the right antenna and 32 in the apparently unbroken left antenna. Regardless of the contraction or extension of the terminal terga, which accounts for some difference in the respective positions of the ovipositor and cerci, the cerci of *sculleni* proportionally are distinctly longer than those of *bifratrilecta*. The nymphs here recorded include numerous specimens of both sexes. The antennae of two pairs of nymphs ranging from 13 to 15 mm in body length have 35 to 38 segments. The smallest nymph is 4 mm long.

<sup>3</sup> The type locality of *barberi* is about 20 miles southwest of Westwood, Calif., near an entrance of the Sunnyside Mine, on the North Fork of the Feather River just above the junction of Butte Creek and about 3 miles below Seneca.

The type locality consists of talus slopes which terminate a small valley a hundred yards wide and a few hundred yards long just above the Sunshine Shelter on the slope between the North and Middle Sister. The valley faces south and the talus slopes are mainly on the westerly part and present a very rocky path to the treeless sides of the Middle Sister.

Mr. Roth writes regarding his collection: "The majority of the specimens were obtained from under rocks within 1½ feet from the snow and ice, and one specimen was collected on the snow under a large rock. The microhabitat most suitable for the insects seemed to be one which was damp but not wet, cold but not freezing, and where there were loose rocks and some soil. At the base of one talus slope where the rocks were partly silted in, no specimens were found. Since the grylloblattids are considered to have nocturnal habits, I visited the talus slope from which I collected most of the specimens about 7 p.m., after the sun had disappeared. Only one specimen was seen during a half hour searching and that was on a rock about 4 inches from the snow."

Several arthropods were found by Mr. Roth in the same environment with *sculleni*, either on or beneath rocks at the snowline. A fungus gnat which occurred in fairly large numbers on the rocks and which did not seem inclined to fly, has been identified by Alan Stone as a new species of *Boletina* (Fungivoridae), a staphylinid by M. H. Hatch as *Phloepterus* sp., and a centipede by R. V. Chamberlin as *Linatenia chionophila* (Wood), "a characteristically northern form, widespread across Canada and the northern United States." M. C. Lane identified an elaterid larva as *Hypolithus nocturnus* (Esch.), and Clarence J. Goodnight identified two phalangids as *Sabacon crassipalpe* (L. Koch) and referred to them as a circumboreal form often found in cold areas.

A nymph 8 mm long had many insect fragments in the digestive tract, including pieces appearing to be from the wing of a fly, and the antenna apparently from a tiny beetle. It seems quite possible that *Boletina* sometimes serves as food for *G. sculleni* in this locality.

***Grylloblatta campodeiformis campodeiformis***

Walker

Figs. 2, 3, 8, 9, 13

*Grylloblatta campodeiformis* Walker, Can. Ent. 46: 93-99, figs. 1-7. 1914. Type locality by original

designation: Sulphur Mountain, near Banff, Alberta.

New distribution records: Missoula, Missoula County, Mont., 3,700 feet, February 11, 1950 (1 female); same, about 3,500 feet, April 12, 1953 (1 male, 1 female), (taken separately under surface rocks at base of rock slide, temperature 34°F.); Mission Mountains, Lake County, Mont., 7,500 to 10,000 feet, September 14, 19, 20, 1952 (1 female, 9 nymphs); vicinity of Holland Look-out, Swan Valley, Lake County, Mont., at summit and localities between there and three miles to the north, elevations from about 6,500 feet to 10,400 feet at summit, October 4, 1952 (5 males, 7 females, 14 nymphs). All collections were made by John A. Chapman, of the Department of Zoology, Montana State University.

Previous Montana records have been summarized and the localities shown on a sketch map (Gurney, 1948, pp. 90-91). Until now, Montana records from west of the Gallatin Canyon have been limited to one large male nymph taken on the snow January 26, 1947 by W. L. Jellison along the East Fork Road, 10 miles east of Sula, Ravalli County. Three counties in a vertical tier along the Rocky Mountains of western Montana are now represented. The widespread character of the distribution is shown by the individual localities in the Mission Mountains area at which Mr. Chapman found specimens, as follows: McDonald Peak, about 10,000 feet; North Branch of the Mission Basin, about 8,000 feet; in the Duncan Lake Drainage, about 7,500 feet. Mr. Chapman found an adult female beneath a board in the yard of his home near Missoula on April 12, 1953. The 16 adults here recorded have a total of 24 unbroken antennae which range in number of segments from 26 to 29 (average, 28.5). As many as 30 segments appear to be uncommon in *c. campodeiformis*.

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*Grylloblattina djakonovi*, n. gen., n. sp., described from a single female found Sept. 20, 1934, by A. M. Djakonov in a rotting tree stump in woods at [? Island] of Petrov in the [? bay] of Siaukh near the mouth of the river Sudzukh, southern Maritime Provinces [of Siberia]. (The locality, ascertained through the cooperation of consultants in the Slavic Room of the Library of Congress, is approximately 90 miles east of Vladivostock, at latitude 42° 52' N. This first locality for the Grylloblattidae



from the Asiatic mainland is about 200 miles farther north than localities in northern Honshu at which *Galloisiana* has been taken, but some 400 miles south of British Columbian habitats of *Grylloblatta*. The genus is most closely related to *Galloisiana* and is especially distinguished by 5-segmented cerci, the apical segment of which is specialized. The latter is widened toward the apex, but is conically and strongly narrowed and finally is cylindrical to the apex.—A.B.G.)

2. CAMPBELL, MATTHEW G. *Notes on Grylloblatta at Kamloops*. Proc. Ent. Soc. British Columbia **45**: 1-5. 1949. Presented posthumously, with editorial notes by G. J. Spencer.

Detailed notes from the personal observations of an amateur entomologist who collected numerous specimens at Kamloops, B. C., and maintained cultures in the basement of his home. The conditions of the natural habitat and those of the culture containers are carefully explained. It is suggested that in cultures soft rotted humus among loose stones is a good medium, with temperatures between 30 and 40° F. It is emphasized that the Kamloops population can survive higher temperatures than the one in Alberta (typical *campodeiformis*), and that exposure to 26° F. is fatal. (It is important that the taxonomic status of the Kamloops population be re-examined by carefully comparing Kamloops males, when available, with those of *G. c. occidentalis*.—A.B.G.)

3. CHOPARD, LUCIEN. *Notoptères*, pp. 587-593, figs. 232-235. In *Traité de Zoologie* **9**: 1117 pp. 1949. Edited by Pierre P. Grassé.

A brief summary in keeping with the reviews of other groups in this basic French text and reference book. No original data apparently. One of the best summaries to be found in a general book.

4. EDWARDS, GEORGE A., AND NUTTING, WILLIAM L. *The influence of temperature upon the respiration and heart activity of Thermobia and Grylloblatta*. Psyche **57**: 33-44. 1950.

The oxygen consumption, heart rate, and activity at various temperatures were determined, in the case of *Grylloblatta* based on specimens from Montana. "*Grylloblatta* is normally active from -2.5 to 11.3 degrees C. At lower temperatures activity is decreased and at higher temperatures activity is increased until at 18 degrees the animals become stuporous and at 20.5 degrees become irreversibly damaged by heat." These insects are "strictly poikilothermal in that they make no metabolic adaptations to offset unfavorable temperatures."

5. ELSEA, J. E. *A new locality for Grylloblatta*. Pan-Pacific Ent. **13**: 57. 1937.
6. GURNEY, ASHLEY B. *The taxonomy and distribution of the Grylloblattidae*. Proc. Ent. Soc. Washington **50**: 86-102, 11 figs., 4 text-figs. 1948.
7. JUDD, W. W. *A comparative study of the proventriculus of orthopteroid insects with reference to use in taxonomy*. Can. Journ. Res. (sect. D) **26**: 93-161, 98 figs. 1948.

The proventriculus of *Grylloblatta* is compared to that of other orthopteroids. In *Grylloblatta* it is described as of globular shape, with 12 longitudinal folds in the intima and two ranks of 12 pyramidal "teeth" each at its posterior end.

8. NUTTING, WILLIAM L. *A comparative anatomical study of the heart and accessory structures of the orthopteroid insects*. Jour. Morph. **89**: 501-598, 21 pls. 1951.

A valuable, basic study of the heart in all principal groups of orthopteroids. The position of *Grylloblatta* at the base of the saltatorial Orthoptera is strongly suggested. The incurrent-excurrent system in this insect "illustrates the basic ancestral plan from which all of the orthopteroid variations may well have been derived," though the author does not conclude that *Grylloblatta* is the ancestral orthopteroid.

9. PLETSCHE, D. J. *The alpine rock crawler, Grylloblatta campodeiformis Walker, in Montana*. Proc. Montana Acad. Sci. **5** and **6**: 17-20. 1947.

*Grylloblatta* collections made in Montana are reviewed, the first specimen having been found by Fred Skoog in 1936 in the Gallatin Canyon south of Bozeman. Nearly all Montana specimens have been taken in the fall, suggesting that the conditions of spring and summer are unfavorable for *G. campodeiformis* in the portions of rock slides and other habitats that are near the surface. In the extreme northwestern corner of Yellowstone National Park, Wyoming, a single specimen was found in May 1939. An ecology class from Montana State College established a study plot of 119 square yards at 7,500 feet altitude in the Bridger Mountains 20 miles north of Bozeman. It is moderately wooded, with a coarse rock slide on an incline of 20 degrees from the horizontal. The total specimens resulting from one visit during each of five years (October or early November, 1938-42) was 121 (18 adults, 103 nymphs). One specimen occurred at least a foot above ground level in a rotten stump. Rarely does more than one specimen occur under the same stone, and ants and other insects seldom are found with *Grylloblatta*. Adults seldom occur under small stones, though rarely they have been found beneath stones as small as 2 x 3 x 4 inches.

10. WALKER, E. M. *On the anatomy of Grylloblatta campodeiformis Walker. The organs of digestion*. Can. Journ. Res. (sect. D), **27**: 309-344, 1 pl., 14 figs. 1949.

A detailed description of digestive organs, with special attention to the proventriculus. The latter is much different from that of the Ensifera in that there are 12 longitudinal divisions characterized by flexible, backwardly directed lamellae instead of six divisions armed with columns of complex sclerotized teeth. The Ensifera have the most powerful and elaborate system of hard toothlike structures on the internal lining of the proventriculus of any group of orthopteroid insects. The proventriculus of *Grylloblatta* is believed to serve as a regulatory valve and also possibly as a propulsive organ for the movement of food through the digestive tract. It is concluded that (1) the grylloblattids are the nearest relatives of the Ensifera, but differ too widely to be included within that group, and (2) the saltatorial habit has been independently evolved in the Ensifera and Caelifera.